Recommendations to the California Energy Commission on Digital-to-Analog Settop Box Power Consumption

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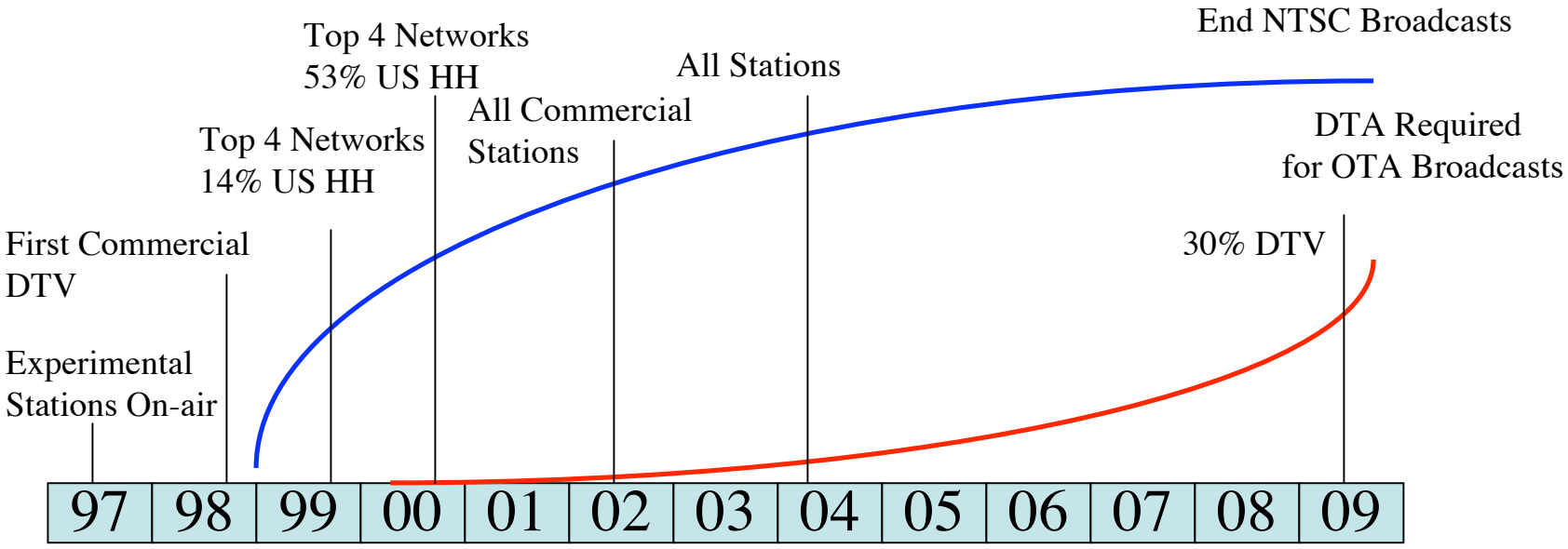
Agenda

- Digital-to-Analog (DTA) Settop Box (STB) status
- California Energy Commission standard
- Generic STB practice
- DTA technology
- Recommendations
- References

HDTV History



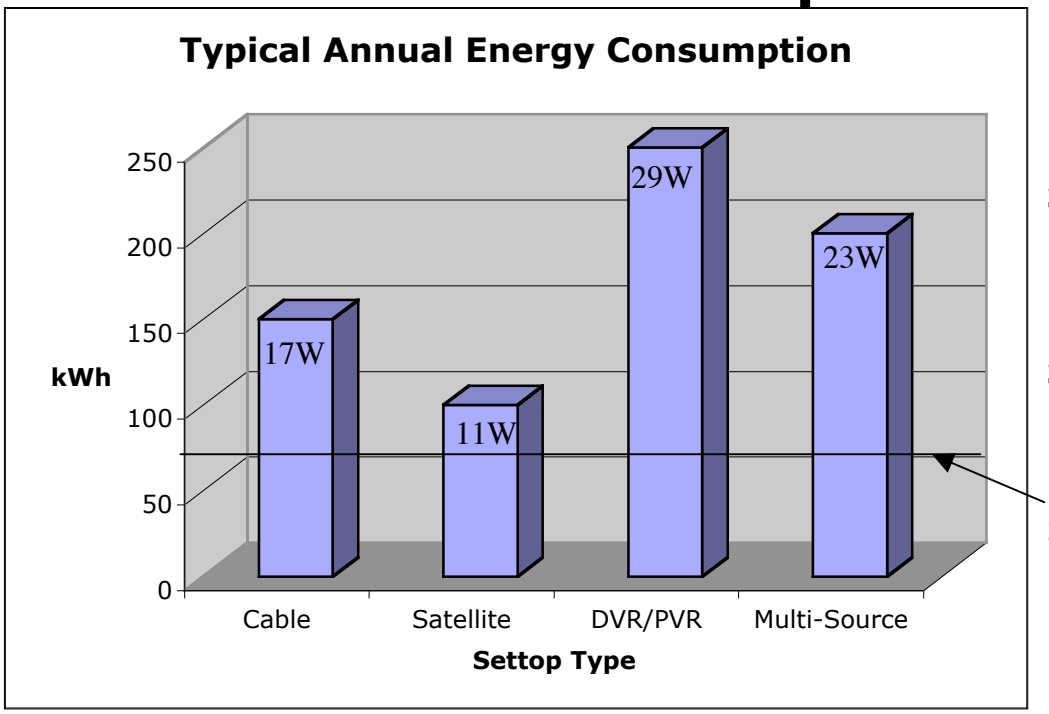
DTA Status

- Analog broadcast signals will go dark in 2009
  - Digital broadcast only after 2009
- Existing televisions will require a DTA
- California has a mandatory standard:
  - 8W power dissipation on, 1W standby
  - Title 20 regulation
  - Standard applicable to DTAs only
  - Standard NOT applicable to other STBs
- Market for DTAs will not exist until 2009

Typical STBs

- Cable and satellite STBs were designed using 5 year old technology
  - High power consumption (10 to 40W on)
  - Over 120 component Bill of Materials (BOM)
  - Standby mode (when available) does not reduce power consumption
- Designs are complex and feature-rich
  - Pay per view
  - Internet access
  - Network connectivity
- Focus on security and management not power
- Physically large enclosures

Current Settop Consumption



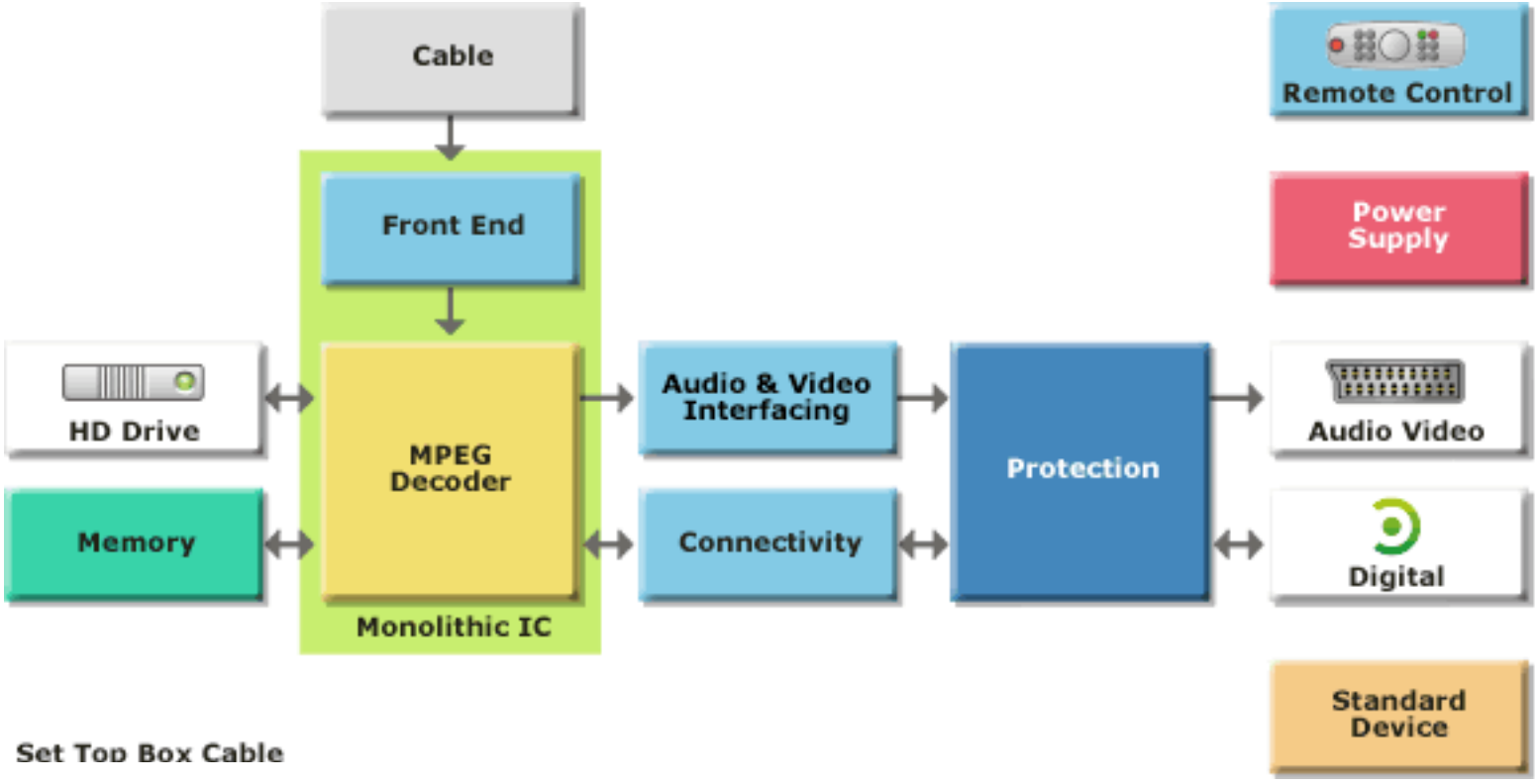
$34/Year

$17/Year

8W standard ($11/year)

EPA Report, June 2005

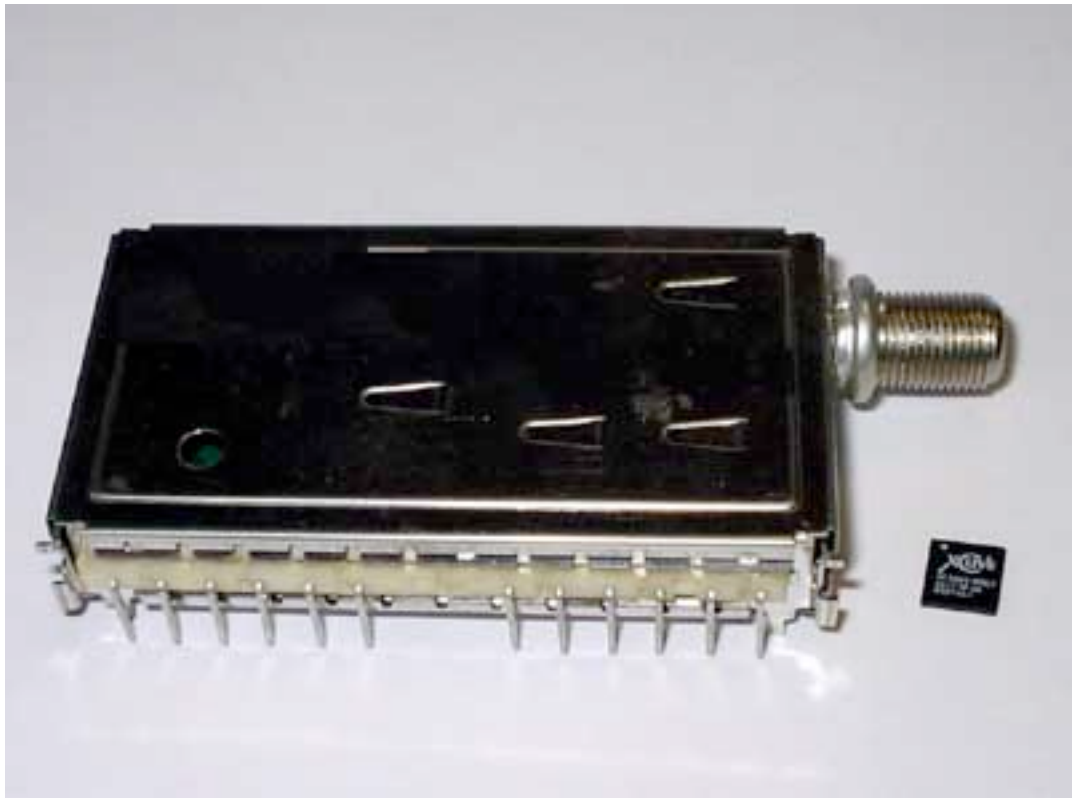
Today's Complex STB Design



New Technology for DTAs

- Single chip ATSC tuners (examples on following pages)
  - Low cost, low power
  - Previously designs used “tin cans” with discrete components
- Single chip 8-VSB demodulators
  - replace multiple chips and complex designs
- Single chip MPEG decoders
  - Substitute for PC’s/co-processors
- TV manufacturers required to provide all TV’s with DTV receivers which expands market and reduces cost

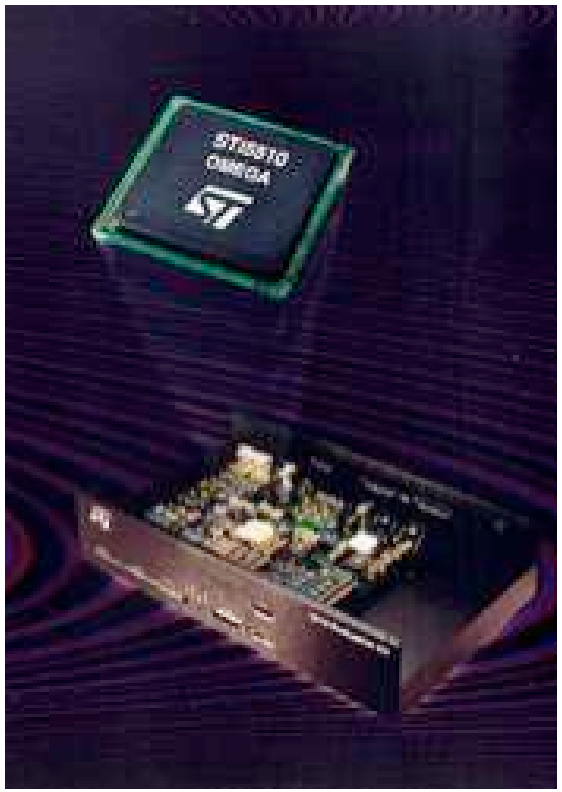
Single Chip Tuner



Xceive, 2005

8-VSB Single Chip Demodulator

MPEG-2 Single Chip Decoder



STMicroelectronics

DTA Examples

- Pace DTA ($140)
  - < 8W on, <1W standby
  - Discontinued due to lack of market demand

- VBOX USB-A 3560 ($130)
  - USB powered, less than 2.5W
  - Does not decode MPEG-2 stream

- Miglia TVMini ($140)
  - USB powered, less than 1W
  - Smallest form factor
- High prices are due to small quantities (less than 1K sales)

DTA Proof Points

- USB powered devices are less than 2W using latest integrated circuits
  - Single chip tuner
  - Single chip demodulator
- Small enclosure (less than 4 square inches)
- Meeting the CEC standard can be done now at low cost!

DTA Design Goals

- 2W power consumption
  - Inclusive of power converter
- BOM cost less than $24
  - IC's $15 (tuner $6, demod $7, decode $2)
  - Passives $2 (e.g., resistors, capacitors, inductors)
  - Printed circuit board $1 (includes connectors)
  - Remote control $1
  - Assembly $2
  - Warranty $1
  - Packaging $1
  - Power converter $1
- Better performance than older technology with BOM of $48

Recommendations

- CEC standard should be retained for DTAs
  - 8W on, 1W standby
- This will save $13 per year per DTA
  - Compared to 17W DTA @ 16.5 cents/kWh
  - And California homes have 2.5 TVs! (=$33/home/yr)
- Propose that a tier 2 standard or voluntary specification be developed
  - 2W active, “very low” standby (<0.5W)
  - Auto power-down becomes less important
- This would save $22 per year per DTA
  - Compared to 17W DTA @ 16.5 cents/kWh

Appendix

References for Chip Technologies

- Single Chip tuners
  - LSI Logic
    - http://www.lsilogic.com/
  - Microtune MT2121 ($6)
    - http://www.microtune.com/products/
  - Xceive 3028 ($7)
    - http://www.xceive.com/technology_XC3028.htm
- Single Chip Demodulators
  - LSI Logic DoMino 8633 ($11)
    http://www.lsilogic.com/products/recorder_dvd_dvr_dtr/dmn_8633.html
  - Broadcom BCM 3517 ($8)
    - http://www.broadcom.com/products/Cable/Digital-TV-Solutions/BCM3517
  - ST Micro STV0370 ($14)
    http://www.st.com/stonline/products/literature/bd/11108/stv0370.htm
  - Micronas DRX-H
    http://www.micronas.com/products/by_function/drx_3942h/product_information/index.html
- Demod/Decode
  - ATI Xilleon 240
    - http://www.ati.com/products/xilleon220/index.html

Backup

- Rationale
- Tipping points
- Historical Power/cost
- Specific Technology

Rationale - Technology

- Cable/satellite settops are older technologies
  - Can Tuners
  - Discrete demodulators/decoders
- Significant advances in component elements
  - Reduced power consumption
  - Reduced parts costs, reduced bill of materials (BOM)

Rationale - Features

- Digital video recorders/personal video recorders
  - Constant on hard disk
  - Significant feature set
- Terrestrial tuners for PC's
  - Low cost
  - Low power
  - Simple
  - Extremely small footprint

Rationale- Proof Points

- USB powered HDTV receivers
- Single chip tuners
- Single chip demodulator/decoders
- Single chip receivers in early release
  - Driven by TV manufacturers
  - FCC mandate for 100% DTV tuner

Over-the-Air Digital-to-Analog STB's

- Few products at this time
- No Market demand
- Tipping point will be when analog broadcasts go dark

Tipping Points for Size/Power

- Single chip ATSC tuners
  - Previously used tin can designs with discrete components
  - Low cost, low power
- Single chip 8-VSB demodulators
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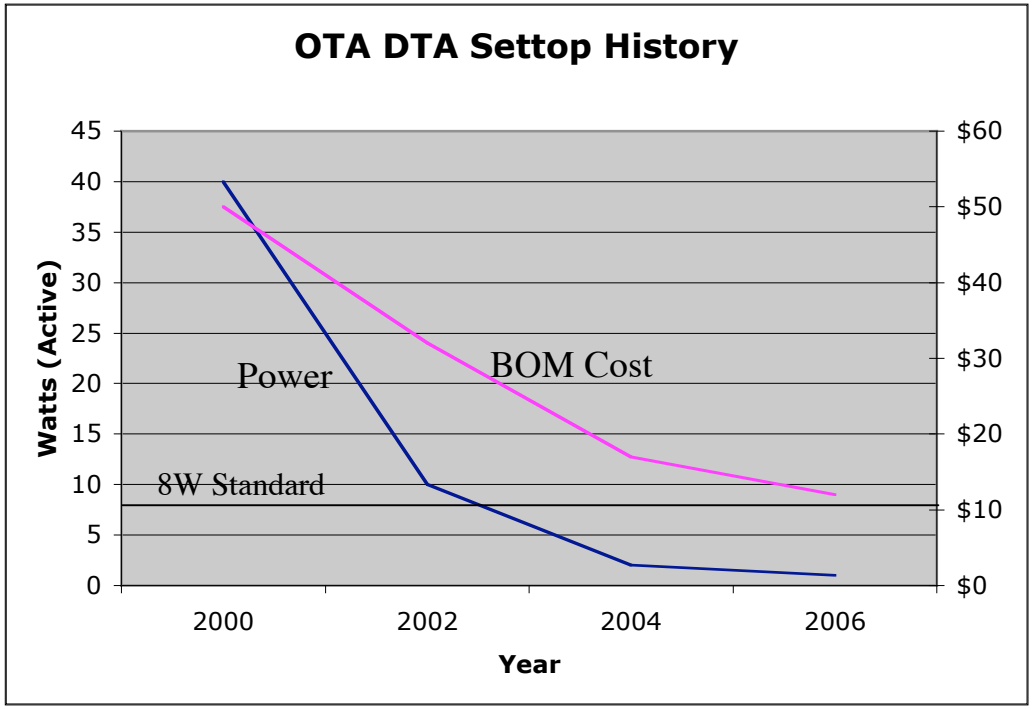
Power/Cost History



Can Tuners

- Alps TDQU
- Sharp